Determining factors in the historical decline in marital fertility in Italy

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Acknowledgment: This research was supported by the Spanish Ministry of Economy and Competitiveness (CSO2017-83290-P).

Abstract

The historical decline in fertility in Italy has been studied by scholars from different disciplines who have tried to explain why the reproductive behaviors of Italian women changed over time. Studies on fertility have long been dominated by the results of the Princeton European Fertility Project (PEFP), but in our opinion these do not attribute the proper weight to socio-economic variables in the processes of demographic transition. This project's shortcomings are probably linked to the limited techniques of analysis available at the time, that is, the late 1960s and early 1970s.

In this paper we use multivariate analysis techniques through panel cointegrating regressions (FMOLS and DOLS). We collected information for 20 Italian regions over a lengthy period of time (1872-1991). The variables used to explain the socio-economic dynamics (e.g. mortality, education, economic development, urbanization and employment) are the same as those used by other authors in the research conducted in the middle of the last century, but the correlations that emerge invite new and interesting interpretations.

The paper concludes by placing an emphasis on the influence that changes in living conditions - economic situation and social status - had on couples' decisions to have children.

Key words: Fertility transition; Italy; region level; panel data; socio-economic factors.

1- Introduction

Analysis of the decline in fertility in Italy must start by taking in the broader context, namely that of western industrialized countries that have experienced a similar demographic composition and that have undergone the Demographic Transition. Some authors understand this phenomenon within a "diffusionist perspective", in which fertility is apparently linked to the spread of new attitudes and behavior regarding having children. They identify new models of social changes that are imposed through the interaction of individuals in society and the influence of the media (Rogers, 1962; Brown, 1981). This later gave rise to the "innovation diffusion theory" that has to do partially with the adoption of innovative behaviors, but which is also concerned with the spreading of certain attitudes (e.g. concerning the cost-benefit analysis of having children) and behaviors (e.g. birth control technologies) that pass from some sectors of the population to others (Casterline, 2001).

In fact, these changes in behavior – which can be assumed to be caused by several factors in addition to those mentioned above – have spread and become normalized thanks to the presence of three conditions: awareness of the benefits deriving from the adoption of new behaviors (*readiness*), willingness to accept cultural changes (*willingness*) and having access to contraceptive means and measures to put the changes into practice (*ability*). This process of innovation spread within countries through a process of dissemination of new ideas and cultural changes (Coale, 1974; Kurek, Lange, 2012). Furthermore, many scholars consider that it is particularly important to consider this phenomenon within certain geographical areas, in addition to social and cultural contexts. This conclusion also emerged from the analysis conducted within the Princeton European Fertility Project (PEFP) led by Ansley Coale and Susan Watkins, which states that the decline in fertility occurring during the first demographic transition was most strongly influenced by the spread of innovative behaviors, rather than by adaptation to changes in economic conditions (Coale and Watkins, 1986).

In Italy, the very rich literature on fertility includes, in addition to the studies conducted by Livi Bacci (1977) within the PEFP, a detailed set of tables of fertility and marriage by cohort and period (Livi Bacci et al., 1968; Livi Bacci and Santini, 1969; Ciucci and De Sarno Prignano, 1974; Santini, 1974; Livi Bacci, 1977; De Simoni, 1989). Other more recent studies have "rediscovered" the partially-exploited results of the Fertility Survey of 1961 by introducing multi-collinear models and giving particular emphasis to cohorts, cultural and biographical variables (including age at marriage) and level of education.

Education has been thought to play an important role in fertility rates (Basu, 2002; Ciucci and De Sarno Prignano, 1974). In particular, women's education appears to have an even more important role than the family economic status if we compare the fertility rate of birth cohorts born at the end of the nineteenth century (Breschi et al., 2013). Even in the period before the demographic transition, socioeconomic differentials in fertility seem to be very small and statistically insignificant (Dribe et al., 2014). In the explanation of cross-country fertility differentials, female employment emerges as important by the late 1980s when Italy, together with the other southern European countries, had low levels of female employment and low levels of fertility compared with northern European countries where the correlation was confirmed in the opposite scenario, namely high levels of both employment and fertility (Vitali and Billari, 2017).

Concerning the causes of fertility decline in Italy, we have a huge literature based mainly on case studies (Breschi and Livi Bacci, 1990; Breschi et al., 2014a; Breschi et al., 2014b), from which a comprehensive analysis concerning the whole country emerges. At micro level particular emphasis has been assigned to the role of the intermediate variables of fertility. Low fertility is explained through the presence of constant low levels of female labor participation, the widespread diffusion of strong family ties and family values and the innate presence of Catholic principles and values (Kertzer et al., 2009).

Our study was designed to take advantage of the availability of a huge database containing demographic and socio-economic data that covers the whole country, which allows us, through disaggregation by region, to grasp both diachronic changes and regional differences. The analysis covers a period of more than one hundred years (1872-1991) that goes far beyond the end of the first demographic transition almost to the end of the twentieth century. Our aim is to offer new interpretations of the factors that could have had an influence on these changes over the twentieth century.

2- Data and sources

A sizeable database was constructed covering information about a large number of variables for all Italian regions. The variables, and the sources from which the data were gathered, are as follows:

.- The Princeton marital fertility index I_g: this is the ratio of the number of births among married women to the number that would occur if married women were subject to maximum fertility (conventionally represented as that found among married Hutterite women).

.- The Princeton nuptiality index I_m: this is the ratio of the number of births married women would experience if subject to the maximum age-specific fertility schedule to the number of births all women would experience if subject to that same maximum fertility schedule. This is an index of the extent to which the marital status distribution would contribute to the attainment of maximum fertility in a population in which all births were to married women. It is a fertility-weighted aggregate index of nuptiality that gives more weight to the proportions of women married at the more prolific ages (less than 30) than at the less prolific ages (Watkins, 1986). The values of I_m go from zero (no married woman) to one (all married women aged 15 to 49).

See Coale and Watkins (1986: 153-162) for information on how I_g and I_m are calculated. Data are available from Livi-Bacci (1977: 84-85 and 104-105). We used the adjusted marital fertility values (I_g) calculated by Livi-Bacci (these data have been corrected for abnormal levels of illegitimacy and the effects of migration). The authors of the present paper calculated the I_g and I_m indices for 1971, 1981, 1991 and 2001.

- Probability of dying in the first five years of life (${}_5q_0$) (both sexes). Source: calculated by the authors for the years 1871, 1881, 1901, 1911, 1921, 1931, 1936, 1951, 1961 and 1971[1]. For the years 1981, 1991 and 2001, we obtained the information from the Istituto Nazionale di Statistica de Italia (http://demo.istat.it/unitav2012/index.html).

- Per capita Gross Domestic Product for the Italian regions in constant 2011 Euros (GDPpc). Source: Felice (2017: Table 1).

- Percentage of urban population (Urbpop): Percentage of population living in cities with over 10,000 inhabitants. Source: Sistema Informativo STorico delle Amministrazioni Territoriali (SISTAT) (http://sistat.istat.it).

- Percentage of illiterate population (Illit). Source: Felice and Vasta (2012: Table A4).

The information obtained corresponds to the years of the censuses. The data for the inter-census years were obtained by linear interpolation. We obtained data for 20 Italian regions[2]: Abruzzi-Molise, Apulia, Basilicata, Calabria, Campania, Emilia-Romagna, Friuli-Venezia Giulia, Latium, Liguria, Lombardy, Piedmont-Aosta Valley, Sardinia, Sicily, The Marches, Trentino-Alto Adige, Tuscany, Umbria and Veneto.

The indicators at our disposal can only describe a few aspects of the living conditions of the population as a whole which can be assumed to have influenced the behavior of individual people. Of course, these are not the only variables that may have affected marital fertility rates, but we trust that they will suffice to help us understand a large part of the story. Equally, it is also possible that the impact of each of these factors affecting fertility may have changed

1 We would like to acknowledge the help of Valentina Ferri and Giuseppe Lollo with collecting the information from the censuses. Without their collaboration, this research would have taken much longer to complete.
2 In this article, since we use a very long historical series, we decided to keep together Abruzzi-Molise and Piedmont-Aosta Valley, which followed a process of separation after the Second World War, the former becoming Abruzzi and Molise in 1963 and the latter becoming Piedmont and Val d'Aosta in 1946.

over time. Moreover, our data are aggregate data from different regions. Previous authors have drawn our attention to the pitfalls of extrapolating from the average patterns in each area to individual people and using this to make assumptions about the fertility rates (Livi Bacci, 1977: 189); this would imply falling into the so-called "ecological fallacy", a logical fallacy in the interpretation of statistical data where inferences about individuals are deduced from inference for the group to which those individuals belong (Freedman, 2002).

The traditional theory of the demographic transition pointed to economic factors as the main cause underlying the historical decline in fertility. Nonetheless, the results of the Princeton European Fertility Project (PEFP) called this theoretical paradigm into question. The PEFP´s outcomes (Coale and Watkins, 1986) clearly pointed to a cultural interpretation of fertility, in contrast to the explanation based on economic factors (Cleland and Wilson, 1987). Some researchers have suggested that the surprising results of the PEFP are precisely due to the fact that this project used aggregate data, and they therefore recommend using individual data in order to study historical changes in reproductive behaviors (Reher, 1999; Brown and Guinnane, 2002; Reher and Sanz-Gimeno, 2007; Cummins, 2009; van Poppel et al., 2012). Historical family reconstructions are the most appropriate instrument for obtaining information of this kind about individuals, but this technique also has grave drawbacks and limitations. For example, the enormous effort required to build such reconstructions means that they usually cover very small geographical areas and short time periods (Corsini, 1967; Kertzer et al., 1989; Manfredini and Breschi, 2008). Although the information obtained is much more detailed, the question remains as to whether what is observed in a small number of villages is representative of the whole country. In other words, it is hard to build a general explanatory theory about specific demographic behaviors on the basis of the results obtained using this kind of technique.

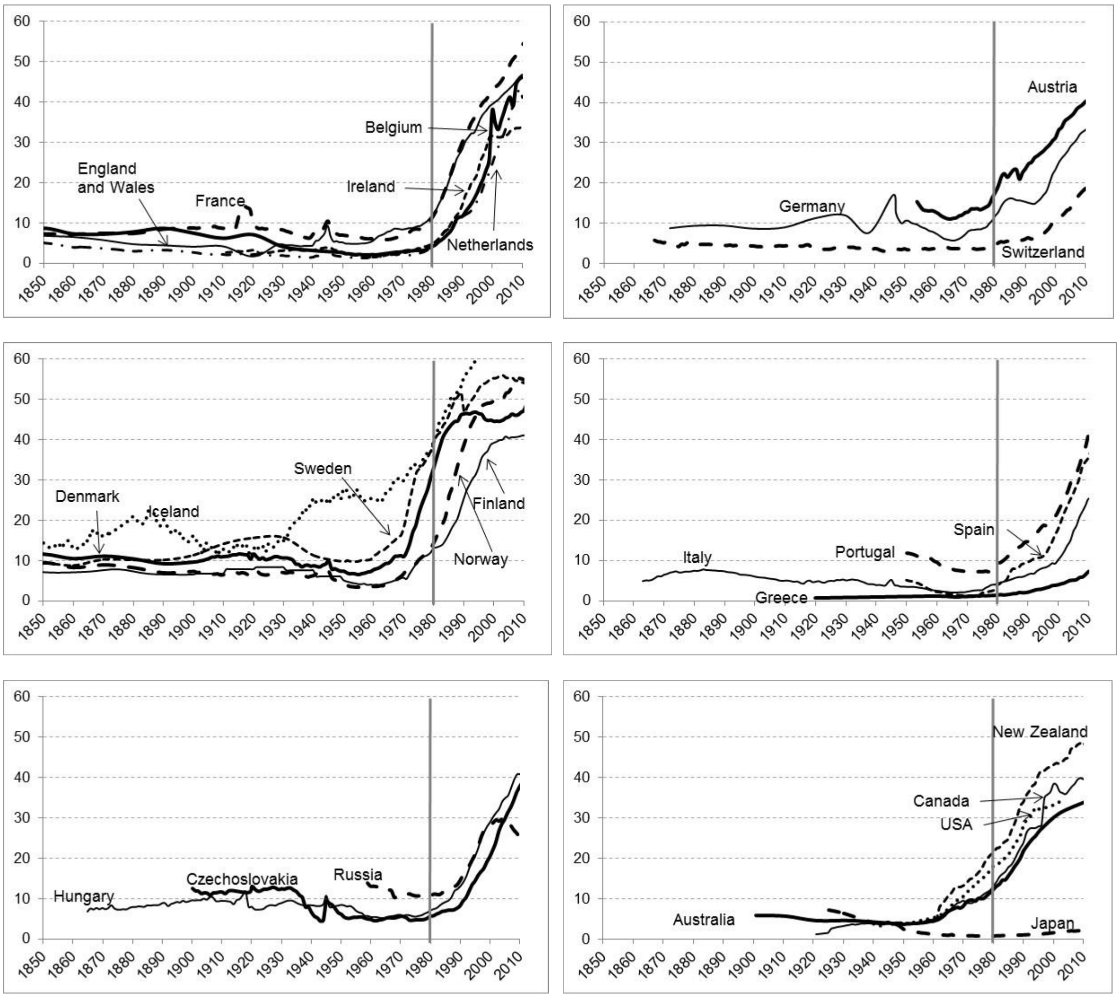
For these reasons, we consider that it is important to complement the rich data from studies based on family reconstructions with information from other sources. Use of aggregate data enables us to cover much greater geographical areas over longer periods of time. In recent years, several studies have been published which exploit modern econometric techniques for the historical analysis of aggregated data on a national level (Ángeles, 2010; Herzer et al., 2012; Murtin, 2013; Breschi et al., 2014; Sánchez-Barricarte, 2017a), and their results have ratified the basic assumptions underlying the theory of the demographic transition.

If we aim to study the historical decline in fertility, we first need to select the appropriate indices which, in addition to being available for the time period and regions in question, have to be sufficiently refined as to allow us to factor out the influence of changes in population structure with regard to marital status, sex and age. Our choice of indices is obviously limited to the information that is recorded in the censuses and the statistics available in each country.

Most studies on the historical decline in fertility are based on total fertility indicators like the crude birth rate (CBR), the total fertility rate (TFR) or the Princeton overall fertility index (I_f) (Gillis et al., 1992). However, we consider that it is not entirely appropriate to use these indices when one's aim is to identify what the historical reasons were that led many families to drastically reduce their number of offspring.

Up to the 1980s (see Figure 1), the percentage of children born outside marriage was very low (in the specific case of Italy, this percentage only reached 10% in 2000). This means that until very recently, access to marriage was a very important mechanism in regulating the total number of children born in a given country. Historically, there were major geographical differences in the percentage of young people who managed to marry and found a family. This percentage also varied over time. For example, in the mid-twentieth century, many western countries saw a major increase in the fertility rates, which has been described by some demographers as a “marriage boom” (Hajnal, 1953; Sánchez-Barricarte, 2018a).

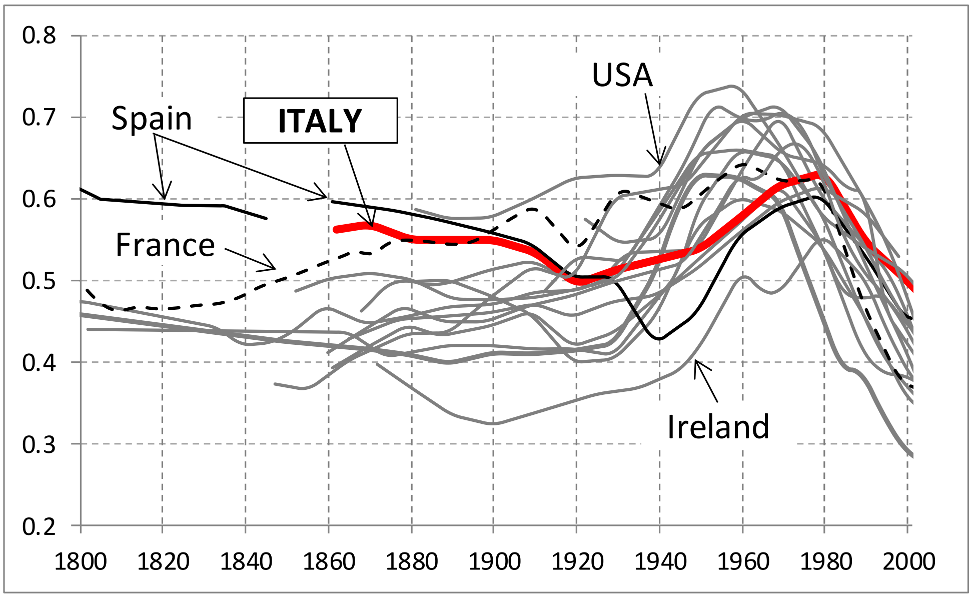
Figure 1. Percentage of births outside marriage.



Source: Sánchez-Barricarte, 2018e: 41.

Figure 2 shows the fluctuations in the Princeton marriage rate (I_m) in various western countries from the late nineteenth century to the early twenty-first century. In the case of Italy, we can observe that in the period 1860-1920 there was a moderate decline in the index I_m. However, from 1920 (and particularly from 1950 onwards), this country experienced a sharp rise in the nuptiality index which reached its peak in 1980 (Bonarini, 2017). From this year on, following the same pattern as that initiated some years before in other western countries, a downward trend set in (the so-called "marriage bust"). This decline was largely due to social trends moving away from traditional marriage towards different ways of living together (cohabitation, civil partnerships, etc.). Clearly, these variations in the nuptiality index, particularly before 1980, had a major impact on the total fertility indices. According to Sánchez-Barricarte (2018a), the so-called "baby boom" observed in almost all western countries was a result not of married couples deciding to have many more children, but of more women actually marrying and being able to have some children. That is, in most western countries, the "baby boom" was largely, though not entirely, a consequence of a "marriage boom".

Figure 2. Developments in the Princeton nuptiality index I_m in selected Western countries.



Countries included in the figure: Australia, Belgium, Canada, Denmark, England and Wales, Finland, France, Germany, Ireland, Italy, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and USA.
Source: Sánchez-Barricarte 2018d: 246.

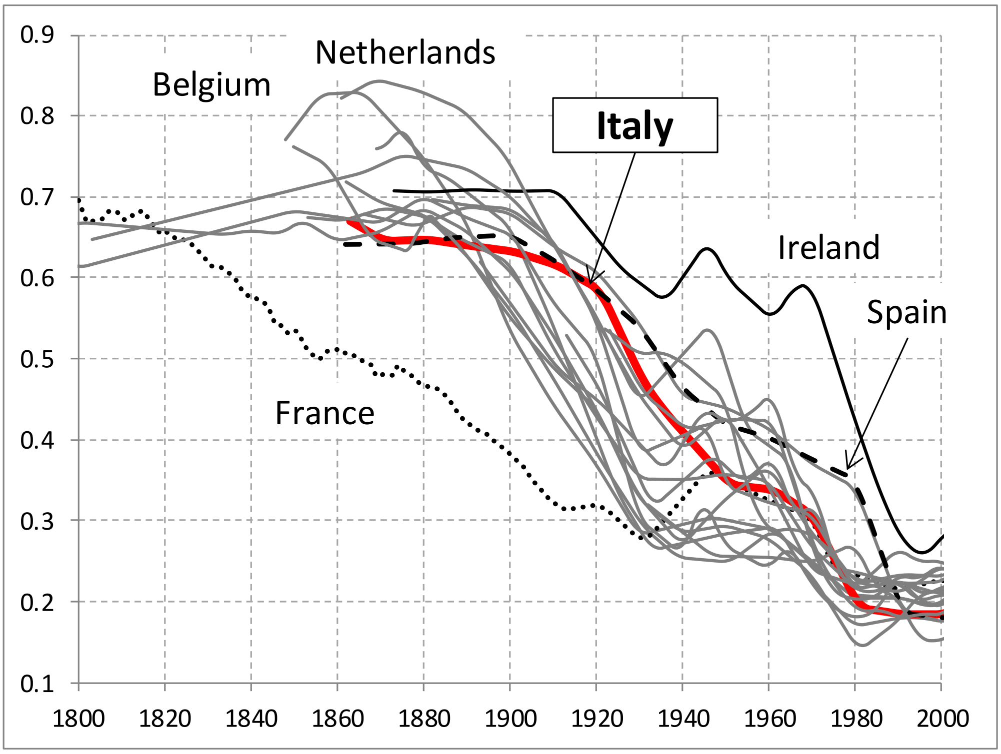
The factors that conditioned young people's access to marriage in historical times may have differed from those that influenced their reproductive decisions later on, and so if we want to identify the reasons why many families decided to have fewer children (that is, the reasons for the changes in reproductive patterns rather than in nuptiality), we must center our attention on analyzing developments in the marital fertility index, that is, on what happens exclusively within marriage. For the purposes of the present study we will therefore not take the total fertility indices into consideration because, as we have explained, they were traditionally strongly affected by the marriage rate as such.

3- Historical developments in marital fertility (I_g)

In the late nineteenth century a persistent decrease in marital fertility began across most western countries[3] (Figure 3). Nonetheless, around the mid-twentieth century this decline was interrupted by an unexpected increase. Although for some decades there was a massive baby boom among couples in various countries (Austria, France, USA and New Zealand), in most cases the rise was so moderate that it would be more appropriate to describe it as a period of stagnation. In southern Europe (including Italy) there was not even stagnation: the drop in marital fertility proceeded unabated (Barbagli and Saraceno, 1997). Marital fertility reached its lowest level in all western countries in the 1980s (Sánchez-Barricarte, 2018b and 2018e).

3 One exception to this was France, because the decline in marital fertility set in there one century earlier, in the late eighteenth century.

Figure 3. Evolution of the Princeton marital fertility index (I_g) in selected Western countries.



Countries included in the Figure: Australia, Belgium, Canada, Czechoslovakia, Denmark, England and Wales, Finland, France, Germany, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, USA.
Source: see Sánchez-Barricarte 2019 (forthcoming).

In the second half of the nineteenth century, marital fertility levels in Italy were (alongside those for France and Spain) among the lowest in western countries. Italy's decline in marital fertility began later than in many central or northern European countries. We can clearly distinguish three stages in the development of the Italian indices: a) From 1872 to 1920, the decline was very moderate. It was precisely the moderate nature of this decrease that meant that in 1920 Italy actually became one of the western countries with the highest levels of marital fertility; b) From 1920 to 1980, the rate of the decline increased notably (although the change slowed down slightly in the period 1950-1970); c) From 1980, the index stabilized at one of the lowest levels found among any of the western countries analyzed.

Piedmont and Aosta Valley, Liguria and Tuscany are the regions that experienced the swiftest and earliest decline. The southern regions were those in which the changes took place latest (see Figure A1 in the Appendix). For a more detailed description of the geographical differences implicated in the historical decline in marital fertility indices (I_g) in the Italian provinces, we refer to the detailed work by Livi Bacci (1977: 142-161).

What we would like to emphasize here is that this process, though by no means peculiar to Italy, was to have particularly important consequences there: the widening gap between the South and the rest of the country.

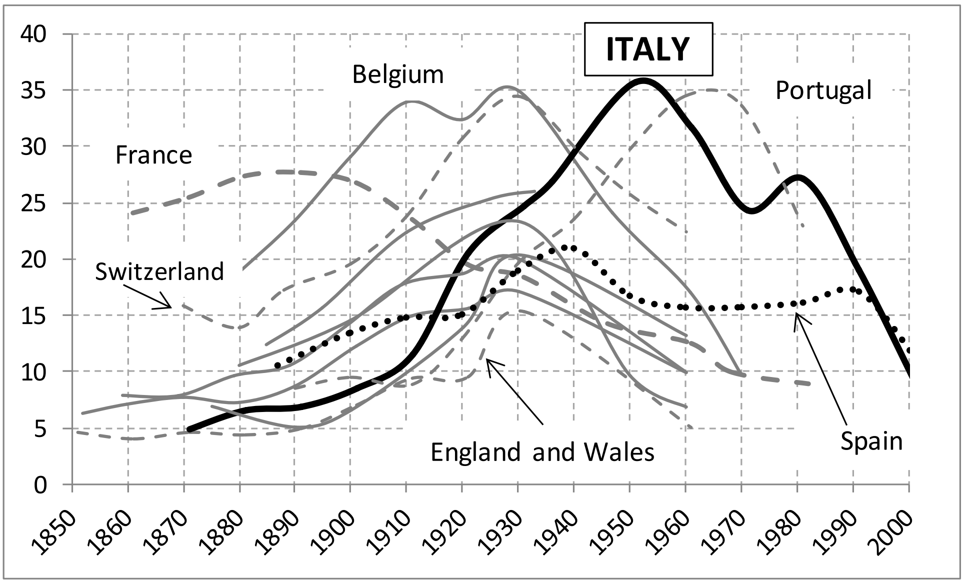
The trend in marital fertility reflects patterns in the General Fertility Rate, which during the transitional period (1871-1971) registered a significant decrease, going from about 144‰ to 67.3‰ on a national level. Fertility in the Mezzogiorno (south) always remained above the Italian average, which highlighted a huge difference compared to the rest of Italy especially from the late 1920s onwards (Pace and Mignolli, 2016).

Returning to the differences between provinces in marital fertility over time, we calculated the coefficient of variation[4] (CV) for various countries over several decades. Figure 4 shows that in the second half of the nineteenth century, Italy was one of the most homogeneous countries as far as marital fertility was concerned. The marked divergences between different provinces, affecting both the date of onset and the rate of the decline in marital fertility, meant that by the mid-twentieth century Italy was the western country with the greatest differences between provinces. It is logical that once the drop in fertility began, the differences should have increased, given that while some provinces saw a marked decline, others appeared to maintain a high, stable fertility rate. It was not until the second half of the twentieth century that the differences began

4 The coefficient of variation, also known as relative standard deviation, is a standardized measure of dispersion of a frequency distribution. It is often expressed as a percentage, and is defined as the ratio of the standard deviation to the mean (or its absolute value).

to be eroded, chiefly because the process of the demographic transition accelerated in the southern provinces (Livi Bacci, 1977).

Figure 4. Evolution of the coefficients of variation in provincial I_g values (in percentages) for different developed countries.



Countries included in the Figure: Belgium, Denmark, England and Wales, France, Germany, Italy, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland.
Source: see Sánchez-Barricarte, 2019 (forthcoming).

4- Factors involved in Italy's historical decline in marital fertility

Identifying the reasons underlying the historical decline in fertility is no easy task, because many different factors must have played a part in this complex phenomenon. Nonetheless, bearing in mind the usual shortcomings of historical studies of this kind (particularly those concerning the limitations on the information available), we now have enough data and modern statistical techniques that can help us to address this issue. We have already mentioned some of the socioeconomic variables for which we have obtained aggregate data for each region in Italy (I_m, ${}_5q_0$, GDPpc, Urbpop, Illit) and which can help us to shed light on this complex problem. The expected relationships between these independent variables and the marital fertility rates (I_g) are as follows:

a) Proportion married (I_m): As Livi Bacci points out (1977: 191), "the underlying hypothesis is that, at least in the initial phase of the decline, the lower is I_m, the higher is I_g". In regions where people married later (which usually have lower I_m), couples need to increase their fertility levels in the later part of the woman's fertile period (let us say between 30 and 45) if they want to reach a given number of descendants. Conversely, couples in regions where marriage occurs earlier can have the same number of offspring over a longer portion of the woman's fertile period, and therefore they can make less use of their fertility potential across their married life. That is, limiting access to marriage acts as a substitute for restricting marital fertility, and the pressure to control fertility will be greater when I_m is high. Moreover, at any given age, the longer the marriage lasts, the lower the frequency of sexual relations will be, and the risk of a further pregnancy will thus also be lower. All these factors contribute to the negative correlation between nuptiality and marital fertility. Sánchez-Barricarte (2017b: 159-161) found that during the period of the demographic transition, in many western countries there was a negative relationship between these two variables.

b) Probability of dying in the first five years of life (${}_5q_0$): a positive correlation is expected with I_g. Populations with higher mortality need higher fertility rates to reach the desired number of offspring. When mortality falls, the pressure to reduce the number of descendants increases.

c) Per capita Gross Domestic Product (GDPpc): an inverse correlation with fertility is expected. Historically, children were an investment, providing the most reliable protective mechanism for facing future difficulties (illness, accidents, aging, etc.). When the state offered no social security backup (healthcare, sick leave and unemployment benefits, pensions, etc.), parents (particularly those with fewest resources) relied on their children for help if they fell ill, had an accident, or they grew too old to earn a living. In this historical socioeconomic context, the increase in income per capita discouraged many couples from having children, because it allowed them to accumulate other resources that could help them face future challenges. The gradual economic development was an outstanding factor in discouraging reproduction because it gave parents greater economic independence from their children. When parents' per capita income rises, they have more options (savings, properties, insurance, etc.) to fall back on in case of difficulties (illness, accident, aging…). That is, as families leave poverty behind, having children ceases to be the only form of insurance for the future (Sánchez-Barricarte, 2017a). Moreover, the increase in per capita income is generally accompanied by a rise in the cost of child rearing (fundamentally, in expenses related to education, food and healthcare).

d) Percentage of urban population (Urbpop): an inverse correlation with fertility is expected. Traditional demographic transition theory also establishes that the percentage of the urban population has a major impact on the changes from high to low fertility (Notestein, 1945). City life discourages reproduction for various reasons: children do not have as many opportunities to become involved in the economic activities undertaken by their parents as was the case in rural areas; the cost of accommodation is much higher than in the countryside; the cost of raising children is greater than in the countryside because more of them stay in education for a longer period of time; women generally work outside the home; etc.

e) Percentage of illiterate population (Illit): a direct relationship with fertility is expected. The educational level of the population may affect preferences for fertility timing, increase women's autonomy, increase contraceptive use, raise the opportunity costs of childbearing, and reduce the child's potential for work inside and outside the home. Education can also reduce fertility severely if opportunity costs increase with schooling (Caldwell 1980; Jejeebhoy 1995; Skirbekk, Kohler, and Prskawetz 2004; Gustafsson and Kalwij 2006; Requena and Salazar 2014).

In his research on the historical decline in fertility in Italy, Livi Bacci (1977: 195-215) used very similar variables to those employed in the present analysis and also carried out multiple and partial correlation analysis. His static and dynamic correlation analyses were rather weak. In many cases, the sign of the coefficients even runs in a sense contrary to the *a priori* expectations. Livi Bacci (1977: 288-289) concluded that "if we want a full explanation of the regional fertility differentials in the North and the Center, we have to look for factors not included in the six retained in the multivariate analysis. The difference among regions is a residual that depends on factors not included in the available statistics […] It is our opinion that further research at the aggregate level is not likely to add to the general picture of fertility decline given in this book".

Brown and Guinnane (2007: 585) pointed out that the conclusions drawn from the Princeton European Fertility Project (PEFP) were based on flawed statistical methodology because the researchers involved in this project never used panel-data[5] techniques (they were not in widespread use when the project was undertaken). In our research, however, we will make use of these techniques. In general terms, our model was constructed as follows:

$$I_{g_{it}} = \beta_0 + \beta_1 I_{m_{it}} + \beta_2 5q0_{it} + \beta_3 lnGDPpc_{it} + \beta_4 Urbpop_{it} + \beta_5 Illit_{it} + \mu_t + \alpha_i + \varepsilon_{it} \quad (1)$$

5 The term panel data is used to refer to data that combine a time dimension with another transversal one.

Where μ_t is a vector of yearly dummies controlling for time effects and α_i is a vector of dummies for each country controlling for fixed effects. These annual *dummy* variables serve to neutralize all those factors that change in the same way in all Italian regions, such as technological advances, wars, fashions, or new legislation. If we did not take these temporal factors into account, we could run the risk of introducing a bias into the results. In the same way, we also included a set of *dummy* variables to control for the possible heterogeneity between the different regions which we cannot neutralize through the variables of interest in areas such as climate, economic and social structure, history, etc. These checks enable us to factor out any spurious relations that may be present within our data.

As the Gross Domestic Product per capita grew exponentially along the twentieth century, before including it in our econometric model we transformed it into natural logarithms (lnGDPpc).

It is necessary to understand that the characteristics of our data situate us within the field of cross section time series. In addition to the typical heterogeneity biases of panel data, we also face the problem of self-correlation proper to time series themselves. With data of a longitudinal type, it is fairly frequent for the perturbation term at a given moment to follow a clear tendency marked by the perturbations associated with earlier moments.

We identified the potential problems that can come up when using this type of data. Using Pesaran's test (2004) of cross sectional independence we were able to prove that the residuals in our data were correlated between the different regions. The dependency of the residuals may lead to a bias in the results (contemporary correlation). On the other hand, following Wooldridge (2002), we also observed that there is a first-order serial correlation problem, as explained above, which might severely affect the standard errors of our estimations[6]. In this case, the error would be defined as an auto-regressive model AR(1) where:

$$\mu_t = \rho\mu_{t-1} + \varepsilon_t \qquad (2)$$

In this case, OLS would not be the best methodology since it underestimates the true variance in the presence of autocorrelation and it makes the t-statistics look too good and reject the null hypothesis too often. After identifying the different problems of auto-correlation, we decided that the best model to use was that known as *Panel Corrected Standard Errors* (PCSE). This model has already been used successfully in other demographic research (Pampel, 2001; Vos, 2009; Prskawetz et al., 2010; Ferrarini and Wesolowski, 2014; Lagerlöf, 2015; Emara, 2016; Sánchez-Barricarte, 2018a, 2018b and 2018c). This methodology makes use of a Prais-Wisten regression to estimate the parameters. The main point is that when calculating the standard errors and the variance-covariance estimates, this methodology assumes that the errors are heteroskedastic and contemporaneously correlated across panels. In accord with Beck and Katz (1995), with a temporal dimension T (120) greater than N (16), the standard errors calculated by the PCSE function are much better than with other alternative methodologies such as Generalized Least Squares (GLS). In particular, in our case, we consider that there is first-order auto-correlation, and that the coefficient of the process AR(1) is specific for each panel.

The nature of our variables might bring to light a possible problem of multi-collinearity, given the high degree of relatedness that may exist between them. Table 1 shows the variance inflation factor. In general, values of this factor greater than 10 indicate a serious problem of multi-collinearity.

6 Both test are statistically significant at 1%.

According to this criterion, none of our variables displays a problem of multi-collinearity.

Table 1. Variance inflation factor (VIF)

Variables	VIF
Illit	7.96
$_5q_0$	6.86
lnGDPpc	5.33
I_m	1.66
Urbpop	1.61

Note: in general, values greater than 10 indicate a serious problem of multi-collinearity.

The results we obtained from applying this model of panel analysis are shown in Table 2. Our analysis is confined to the period between 1871 and 1991. 1871 is the first year for which we have data. We took 1991 as the cut-off point because we consider that by this year the fertility transition was complete in all the regions, and that from this point onwards, a marked process of de-institutionalization of the family in Italian society set in which made its presence felt both in the increase in cohabitation (García-Pereiro and Pace, 2014) and in the percentage of births outside marriage (see Figure 1). After 1991, nuptiality ceased to be a mechanism for regulating fertility and the index I_m is underestimated. Our main aim is to analyze the reasons underlying what is known as the "first demographic transition". The changes that ensued from the 1990s onwards fall within the framework of what is now called the "second demographic transition" (van de Kaa, 1987)

Table 2. Panel fixed and time effects corrected standard errors (I_g, dependent variable), Italian regions, 1871–1991.

VARIABLES	Model 1	Model 2	Model 3	Model 4	Model 5
lnGDPpc	-4,27E-02 **	-4,10E-02 **	-4,54E-02 ***	-5,18E-02 ***	-5,39E-02 ***
	1,76E-02	*1,69E-02*	*1,70E-02*	*1,56E-02*	*1,57E-02*
$_5q_0$		5,39E-01 ***	4,52E-01 ***	4,90E-01 ***	5,30E-01 ***
		9,02E-02	*8,48E-02*	*8,01E-02*	*8,02E-02*
Illit			1,79E-03 **	2,07E-03 ***	2,32E-03 ***
			7,10E-04	*6,69E-04*	*6,86E-04*
Urbpop				-3,58E-03 ***	-3,37E-03 ***
				3,65E-04	*3,58E-04*
I_m					-2,62E-01 ***
					5,99E-02
Observations	1888	1888	1888	1888	1888
R^2	0,89	0,90	0,90	0,93	0,93
Time period	1871-1991	1871-1991	1871-1991	1871-1991	1871-1991
Regions	16	16	16	16	16

Signif. codes: p-value <0.01 '***' <0.05 '**' <0.1 '*'
Standard error in italics.
Note: only 16 regions were used, since we excluded data from Friuli-Venezia Giulia and Trentino-Alto Adige because the earliest data available are from 1931.

The results obtained using the Panel Corrected Standard Errors model on our database covering the regions of Italy not only confirm the *a priori* expectations but also are statistically significant in all cases. In the different models in Table 2 we can see that the consequent inclusion of new variables affects neither the sign nor the high significance of the previous ones.

These results constitute experimental confirmation of the assumptions on which the traditional theory of the demographic transition is based, and which were questioned by the PEFP: birth rates fall when modernization occurs. We can deduce that the weak and, on occasions, contradictory conclusions obtained in studies linked to the PEFP were probably due, as Brown and Guinnane (2007) suggest, to inadequate and incomplete statistical handling of the data. However, when modern panel analysis techniques are used, the hypotheses formulated in the theory of the demographic transition can be confirmed.

These results obtained using the data from the regions of Italy are fully consistent with those found in previous studies using both national data (Dribe, 2009; Ángeles, 2010; Herzer et al., 2012; Murtin, 2013; Sánchez-Barricarte; 2017a) and provincial data (Sánchez-Barricarte, 2019 forthcoming). Moreover, all these studies come to conclusions that are very similar to those of research based on individual data obtained using family reconstruction techniques (Reher and Sanz-Gimeno 2007; Schellekens and van Poppel 2012; Bengtsson and Dribe 2014; Reher and Sandström 2015; Reher et al. 2017).

5- Conclusions

It is clear that the Princeton European Fertility Project (PEFP) and subsequent studies on the reasons for the historical decline in fertility between the end of the nineteenth century and the middle of the twentieth century have greatly contributed to the literature on this topic. However, the conclusions of these studies are marred by the fact that their analysis are confined to the use of aggregated data on the whole countries, and by their use of statistical techniques that have now been superseded.

More recently, very interesting results have emerged from the study of the so-called lowest-low fertility aimed at verifying how much the diffusionist perspective was still able to explain some of the fertility behaviors in the Italian provinces. Regression models were applied using techniques based on the spatial cross-sectional and spatial panel perspective, through an in-depth analysis of the association of a series of indicators including economic factors such as the gender gap (proxy of female occupation) and the GDP. In these, the latter turns out to be, in terms of total average effects, the most important variable for explaining fertility patterns in Italian provinces (Vitali and Billari, 2017).

Our paper provides support for the literature (Brown and Guinnane, 2007) that criticizes the conclusions reached by the researchers of the Princeton

European Fertility Project (PEFP), who argued that social and economic factors did not play an important role in bringing about the fertility transition. We agree with researchers who maintain that structural economic variables are indeed predictive of fertility decline (Goldstein and Klüsener, 2010).

Our results enable us to speak with greater conviction concerning the extremely important role of socioeconomic factors in the historical decline of fertility. In our analysis, through the use of refined econometric analyses (FMOLS and DOLS), we used economic and socio-demographic variables (per capita income, life expectancy at birth, educational level, urban population and the employment rate), showing them to be statistically significant and extremely robust in their relationship to marital fertility values in the long term.

Obviously, the variables included in our econometric model for Italian regions are far from exhausting the list of possible factors that influenced the historical decline in fertility. This is a multi-causal phenomenon that surely includes more factors than those strictly linked to the modernization of society. A further step will be to test the influence that the process of secularization in Italian society could have had at the same time as the historical decline in marital fertility was taking place.

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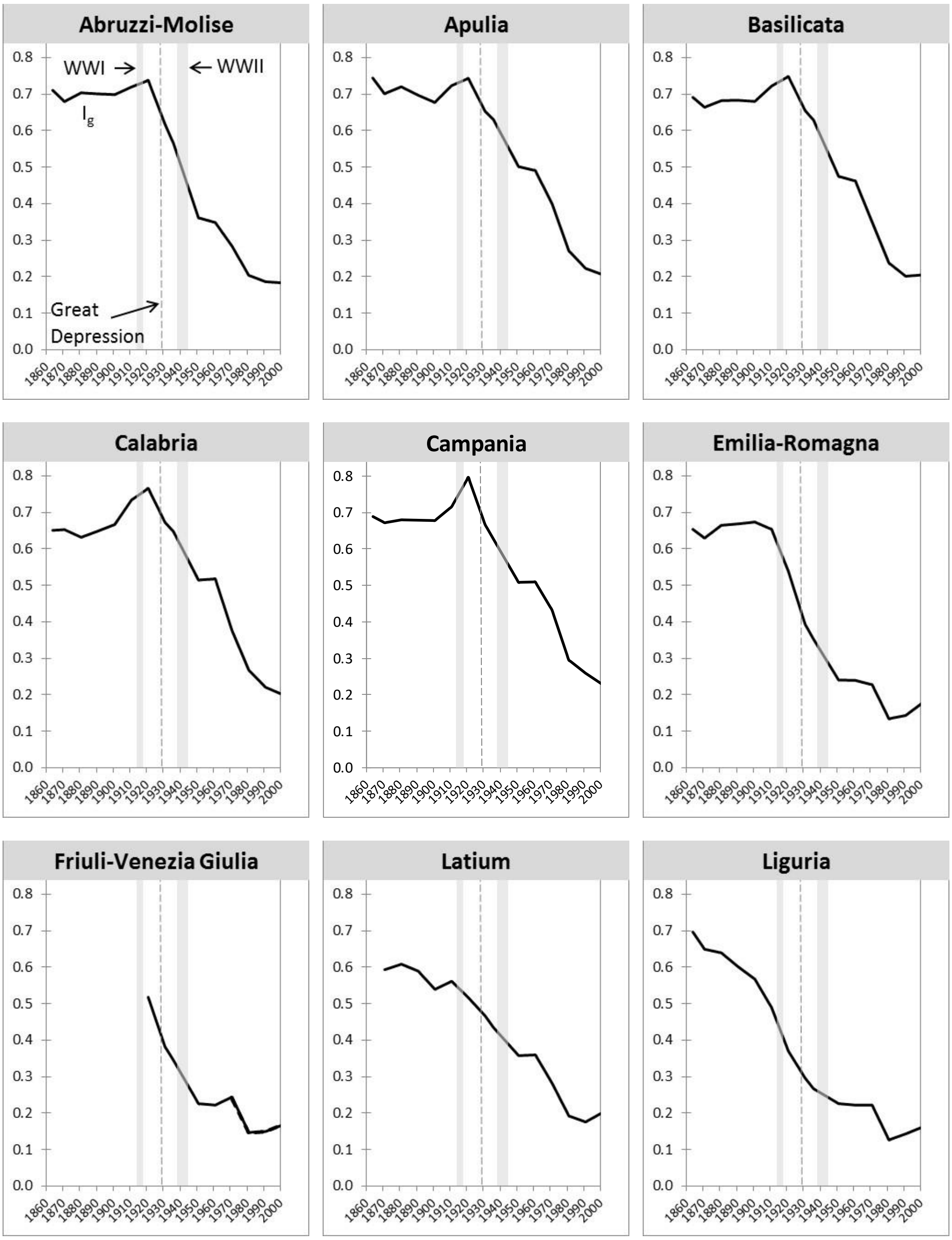
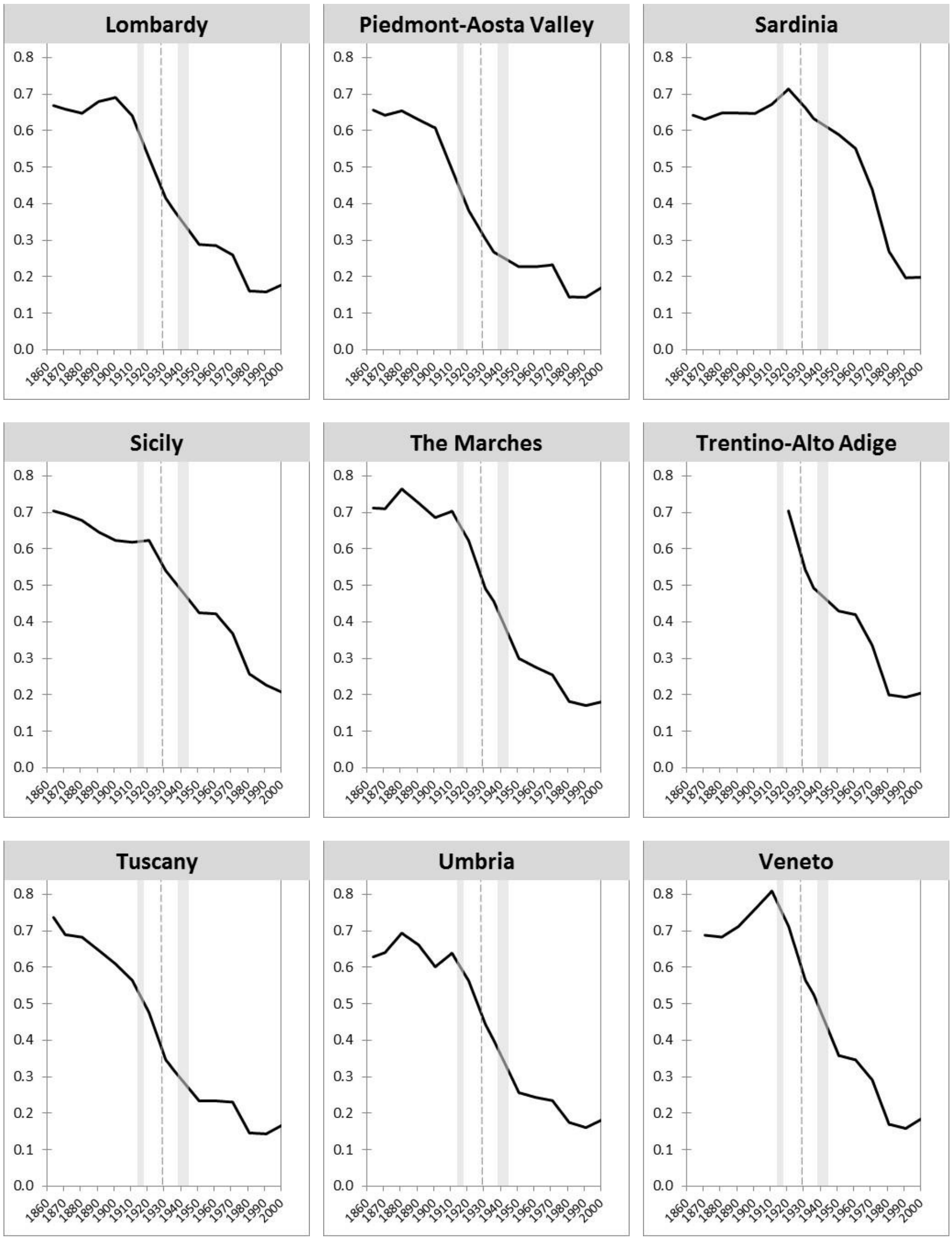
APPENDIX

Figure A1. Historical development of the index of marital fertility I_g in the regions of Italy.




Lombardy
Piedmont-Aosta Valley
Sardinia
Sicily
The Marches
Trentino-Alto Adige
Tuscany
Umbria
Veneto
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